

PSYCHE

A JOURNAL OF ENTOMOLOGY

ESTABLISHED IN 1874

VOL. XXXI

JUNE-AUGUST 1924

Nos. 3-4



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PSYCHE is published bi-monthly, the issues appearing in February, April, June, August, October and December. Subscription price, per year, payable in advance: \$2.00 to subscribers in the United States, Canada or Mexico; foreign postage, 15 cents extra. Single copies, 40 cents.

Cheques and remittances should be addressed to Treasurer, Cambridge Entomological Club, Bussey Institution, Forest Hills, Boston 30, Mass.

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Entered as second-class mail matter at the Post Office at Boston, Mass. Acceptance for mailing at special rate of postage provided in Section 1103, Act of October 3, 1917, authorized on June 29, 1918.

PSYCHE

VOL. XXXI.

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NORTH AMERICAN SPECIES OF THE SUBGENERA *OPACIFRONS* DUDA AND *PTEREMIS* RONDANI OF THE GENUS *LEPTOCERA* OLIVIER¹ (DIPTERA, BORBORIDÆ)

BY ANTHONY SPULER.

Pullman, Washington.

INTRODUCTION.

The subgenus *Opacifrons* Duda is comparatively small and contains but a few North American species. In none of the species are the individuals abundant. Some of the species are represented by a single or a few specimens.

The subgenus *Pteremis* Rondani is represented by but three North American species. The characters in this subgenus are so striking that there is a question whether *Pteremis* should be classed as a subgenus as Dr. O. Duda has done, or whether it should be classed as a genus as was done by Rondani.

This paper is one of a series of papers on the North American species of the Family Borboridæ.

Opacifrons Duda.

Duda: Abahnd. Zool-botan. Ges. Wien., X. I. 28 (1918).

Frontal triangle opaque; preapical bristle usually absent; apical bristle always absent; hind tibiæ uniformly short hairy; first section of costa more or less densely short hairy; last section of third vein straight or gently curved like letter S; usually not more than three pairs of dorsocentral bristles, the anterior pair not convergent; posthumeral bristles usually absent; scutellum with four marginal bristles.

Genotype.—*O. coxata* Stenh. by present designation.

¹Contribution from the Division of Entomology of the Agricultural Experiment Station, State College of Washington.

Species of *Opacifrons* Duda.

1. Preapical bristle present in the female, absent in the male... 2
 Preapical bristle absent in both sexes..... 4
2. Second section of costa distinctly longer than third..... 3
 Second and third sections of costa equal or nearly so..... 5
3. Wings with dark infuscations along all veins with exception
 of last section of third; front with three silvery pollinose
 areas located as follows; one on each side and one directly
 in front of the ocellar tubercle; dorsocentral bristles in
 three pairs; acrostichal bristles distinct; halteres yellow
 Fig. 1..... *grandis* n. sp.
 Wings clear; veins not so marked; front without such
 markings..... 4
4. Front, face and cheeks black; interfrontal bristles in four
 pairs, the anterior pair weak; orbital setulae strong, as
 strong as the anterior pair of interfrontal bristles; wings
 clear; veins black; legs black; outer crossvein below
 apical third of last section of second vein; halteres yellow.
 Fig. 10..... *sciaspidis* n. sp.
 Cheeks brownish yellow; legs brownish yellow; outer cross-
 vein below middle of last section of second vein; smaller
 species. 1.5 mm..... *cartagensis* Mall.
5. Lower front, anterior margin of epistome and anterior portions
 of cheeks yellowish; face fuscous; interfrontal bristles in
 three pairs, all three pairs cruciate; wings browned, veins
 blackish; notum opaque, brownish-black; acrostichal
 bristles distinct; halteres yellow. Fig. 6. *calobata* n. sp.
 Lower front opaque black; face and cheeks yellow; inter-
 frontal bristles in four pairs, the upper and lower reduced,
 the middle two pairs cruciate; notum slightly to distinctly
 shining black; acrostichal bristles weak; wing veins pale;
 halteres fuscous. Fig. 8..... *pellucida* n. sp.

6. Second section of costa longer than third; face, cheeks, and two spots on front silvery pollinose; notum glossy black; acrostichal setulæ very short; hind metatarsi one-half as long as second joint; abdomen piceous, hind margins of segments narrowly yellowish; halteres whitish. Fig. 4.....*wheeleri* n. sp.
7. Lower front reddish; interfrontal bristles not cruciate, the lower pair weaker than the others; last section of third vein slightly curved up; face and cheeks black or grayish; second section of abdomen as long as the next two. Fig. 7.....*corata* Stenh.
Entire front black; face and cheeks yellow or with the posterior portion of cheeks blackish; lower two pairs of interfrontal bristles cruciate; second segment of abdomen but little longer than third. Fig. 9.....*convexa* n. sp.

***Limosina (Opacifrons) grandis* n. sp. (Fig. 1.)**

Subshining black. Front decidedly convex, opaque, almost twice as broad as deep; the divergent stripes velvety black; setigerous stripes and frontal triangle slightly silvery pollinose; vertex with a distinct silvery pollinose spot on each side and one directly in front of ocellar triangle; fronto-orbital bristles nearly uniform in size; upper two orbital setulæ bristle-like, as strong as the upper pair of interfrontal bristles; interfrontal setæ bristle-like, in three pairs, at right angles to the interfrontal rows; face gray dusted, slightly carinate; clypeus broadly visible from in front; cheeks silvery pollinose; at its narrowest point, one-third as high as eye; buccæ with a long upcurved outer bristle and three small setæ; oral margin with a row of long hairs; antennæ with third joint rounded, much larger than second and with minute whitish pubescence; arista three times antennal length with rather long pubescence. Mesonotum with three pairs of dorsocentral bristles in widely divergent rows; acrostichal setulæ strong, in eight rows between the anterior pair and in four rows between the posterior pair of dorsocentral bristles; scutellum triangular; marginal bristles four;

pleuræ opaque black; sternopleuræ with as very strong posterior and a rather weak anterior bristle. Legs piceous; coxæ and trochanters silvery pollinose; knees fuscous; front femora with a row of long hairs on its anterior side, middle femora with a row of seven strong anterior preapical setæ; middle tibiæ with five extensor, two on basal third and three on apical third, and two flexor bristles, one at middle and one near apex; (preapical bristle absent in male) hind tibiæ without marchochætæ, hind metatarsi thickened, one-half as long as the much thinner second joint. Wings slightly browned, with heavy black markings along all veins with the exception of the third vein; veins black; costa ending slightly beyond third vein; first section short, ciliate, with two basal bristles, equal to third and three-fourths as long as second; penultimate sections of third and fourth veins subequal, one-third as long as last section of second vein and two and one-half times outer crossvein, third vein slightly bent forward, then backward and again forward on last section, and ending near wing-tip; fourth vein traceable to wing-margin, fifth vein produced a short distance beyond outer cross vein, discal cell broad at middle and narrowed at outer crossvein. Abdomen opaque, hairy, second segment a little longer than the others. Halteres yellow.

Length 4 mm.

Type.—Female; Portland, Oregon. Aug. 20, 1909. (Melander).

Paratypes.—Three specimens from Adna, Lake Cushman, and Quilcene, Wash. (Melander).

Leptocera (Opacifrons) sciaspidis n. sp. (Fig. 10).

Shining black; Front two times as broad as deep, slightly convex; setigerous stripes and frontal triangle slightly gray dusted, the divergent stripes velvety black; fronto-orbital bristles strong, widely divergent, the lower three-fourths as long as upper; orbital setulæ not extending above the upper fronto-orbital bristle, the upper three, bristle-like, the upper most setæ nearly as strong as the posterior pair of interfrontal bristles;

interfrontal bristles strong, in four pairs, the anterior pair reduced, the other three increasing in size anteriorly, with the third pair from above, cruciate; antennæ prominent, second joint with strong bristles, third joint oval, larger than second; arista two and one-half times antennal length, its pubescence short and dense; face concave in profile, slightly gray dusted; carina developed between the antennæ only; clypeus broadly visible from in front; cheeks gray dusted, one-fourth eye height; buccæ with a strong anterior upcurved bristle and three setæ; oral setulæ hair-like. Mesonotum with three distinct pairs of dorsocentral bristles, increasing in size posteriorly; acrostichal setulæ arranged in six rows between the anterior pair of dorsocentral bristles, the middle rows longer than the others; posthumerals absent; scutellum large, triangular, marginal bristles four, the posterior pair very long; upper sternopleuræ with two anterior setæ and a long posterior bristle. Legs with knees browned; front femora with five hair-like extensor and four preapical flexor bristles, middle femora with six preapical anterior bristles; middle tibiæ with five extensor, two before middle and two on apical third, and two flexor bristles, one at middle and one at near apex (preapical bristle absent in male); middle metatarsi with a flexor bristle at basal third and a number of apical bristles; hind tibiæ with a row of hair-like bristles on outer side; first and second joints of hind tarsi with a brush of stiff hairs beneath; hind metatarsi one-half as long as next joint. Abdomen broad, shorter than thorax; second segment one and one-half times as long as third; hypopygium moderately large and hairy. Wings slightly browned; second section of costa distinctly longer than third; first section weakly bristly and equal to third; penultimate section of third and fourth veins subequal and two times outer crossvein; last section of third vein nearly straight; fourth vein traceable to wing-margin; fifth vein produced but little beyond outer crossvein. Halteres white. Length: 2.5-3mm.

Type.—Female; Friday Harbor. June 25, 1909. (Melanders)

Paratypes.—Fifty-one specimens of this species, distributed as follows:

Washington: Glenwood, Mt. Rainier, Husum, Friday Harbor, Olympia, Adna, Mt. Constitution, Kettle Falls, Roche Harbor, Wawawai, Nahcotta (Melander).

Idaho: Potlatch, Moscow, Juliaetta, Kendrick, (Melander); Troy (Cresson).

Leptocera (Opacifrons) cartagensis Malloch.

Malloch; Tran. Am. Ent. Soc. 40. 17 (1914). (*Leptocera*)
Costa Rica.

Leptocera (Opacifrons) caelobata n. sp. (Fig. 6).

Opaque black. Front for the most part reddish, changing to brown or black toward occiput; bristles strong; fronto-orbitals divergent; the lower three-fourths as long as upper; orbital setulæ weak; interfrontal bristles in three pairs, the upper pair touching, the lower two pairs longer and cruciate; face and cheeks pale brown, with gray pollen; face concave in profile; cheek at vibrissal angle two-fifths as high as eye, buccal bristles in two pairs, the anterior pair quite strong; oral setæ long, hair-like; second joint of antennæ with strong apical bristles; third joint rounded; arista two times antennal length, microscopically pubescent. Mesonotum with three pairs of dorsocentral bristles; discal setulæ strong, middle acrostichals prominent, posterior pair bristle-like; scutellum triangular; disc bare, marginal bristle four; pleuræ with some grayish pollen; pleural sutures reddish, sternopleuræ with a single posterior bristle. Legs hairy, coxæ and trochanters fuscous; middle femora with six antero-apical bristles, the apical one very strong; middle tibiæ with five extensor bristles, a pair at basal third and three on apical third; hind metatarsi two-thirds as long as second joint. Wings infumated, veins black; costa produced to end of third vein, second section as long as third; basal section of third vein two times outer crossvein and a little longer than distance between crossveins, third vein straight on its last section, or slightly curved up at apex, ending near wing-

tip, vein four faintly produced to wing-margin; vein five produced one-third distance from outer crossvein to wing-margin; discal cell broad. Abdomen cylindrical, very short, but little more than half as long as thorax; second segment as long as third. Halteres yellow. Length: 3 mm.

Type.—Male: Pullman, Wash. June 10, 1911. (Melander.)

Paratype.—A single specimen from Pateros, Wash. (Melander).

Leptocera (Opacifrons) pellucida n. sp. (Fig. 8.)

Opaque black. Front convex, two-thirds as broad as deep, slightly gray dusted except on the divergent stripes and lower orbital stripes; lower fronto-orbital bristle three-fourths as long as upper; orbital setulæ microscopic; interfrontal bristles in four pairs, the anterior and posterior pairs weak, the middle two pairs long and cruciate; interfrontal setulæ microscopic; face and cheeks yellow; face deeply concave in profile; anterior margin of epistome slightly projecting; clypeus not visible from in front; cheek at vibrissal angle one-fourth as high as eye; oral setulæ weak, hair-like; buccal setulæ in three pairs, the anterior pair stronger than the others, bristle-like; antennæ fuscous, third joint oval, equal in length to second; arista two and one-half times antennal length, pubescence microscopic. Mesonotum with three pairs of dorsocentral bristles, increasing in size posteriorly; discal setulæ in six rows between anterior pair and two rows between posterior pairs of dorsocentral bristles; scutellum triangular; marginal bristles four; pleuræ with gray pollen; pleural sutures reddish; sternopleuræ with a strong posterior bristle and two small anterior setæ. Legs brown; front femora with hair-like bristles; middle trochanter with a weak bristle; middle femora with five antero-preapical bristles, increasing in size apically, middle tibia with two pairs of extensor bristles, one on basal-fourth and one on apical fourth; hind metatarsi two-thirds as long as next joint. Wings hyaline; veins brown; costa extended slightly beyond third vein, second and third sections subequal; discal cell short; outer crossvein nearly as

long as distance between crossveins; basal section of third vein less than one-half as long as last section of second vein and less than two times as long as second section of fourth vein; fourth vein not reaching wing-margin; fifth vein extending beyond outer crossvein. Abdomen as long as thorax, fuscous, margins of segments lighter; second segment one and one-half times third. Halteres fuscous.

Length: 2 mm.

Type.—Male; Oroville, Wash. (Melander).

Paratypes.—Seven specimens from the following localities:

Washington: Oroville, Pullman (Melander).

British Columbia: Bear Lake (U. S. N. M.)

Leptocera (*Opacifrons*) *wheeleri* n. sp. (Fig. 4).

Front olivaceous black; ocellar triangle bordered on each side by a conspicuous lunate silvery-pollinose spot, lower frontal triangle depressed and with sloping sides, because of the sloping sides the depressed portion of the frontal triangle appears to have a different color than the rest of the front; bristles not very conspicuous; interfrontal bristles in five pairs, increasing in size anteriorly to middle pair, then decreasing, but not cruciate; face and cheeks silvery pollinose; face shallowly concave in profile; oral vibrissæ short; bucca with a distinct anterior bristle and a few posterior setæ; oral setulæ distinct; antennæ moderate in size, third joint with whitish pubescence; arista two and one-half times antennal length, microscopically pubescent. Thorax and scutellum glistening black with an opaque brownish pollinose stripe between the base of the wings and the humeri; dorsocentral bristles in four pairs; acrostichal setulæ very fine and short, arranged in eight rows between the anterior pair of dorsocentral bristles; scutellum trapezoidal, blunt at tip; marginal bristles four; pleuræ with the exception of the extreme upper portion, white-pollinose; upper sternopleuræ with a strong posterior bristle and minute anterior setæ. Legs black; tarsi brown; femora and tibiæ slightly gray dusted; all

the bristles somewhat reduced; middle femora with a single preapical anterior setæ, middle tibiæ with four extensor, one on basal third, and two on apical fourth, and no flexor bristles, middle tarsi with a small seta on flexor surface near base; hind metatarsi as thick as tibiæ at apex and one-half as long as the much more slender second joint. Wings hyaline or but slightly yellowish; veins brown; costa extending slightly beyond third vein, second section one and one-fourth times as long as third; second vein ending beyond the outer crossvein; basal section of third vein one-third as long as the last section of second vein and nearly two times outer crossvein; last section of third vein gently curved, ending a little before wing-tip; fourth vein reaching margin of wing; fifth vein produced considerably beyond outer crossvein. Abdomen piceous, flat oval; hind margins of segments narrowly yellowish; second segment not much longer than third. Halteres whitish. Length: 2 mm.

Type.—Female; Austin, Texas; Oct. 29, 1899 (Melander).

Paratypes.—Two specimens from Illinois (Ill. Univ.)

Leptocera (Opacifrons) coxata Stenhammar (Fig. 7).

Stenhammar: Coprom. Scand. 396 (138) (1855). (*Limosina*).

Duda: Abhand. Zool.-Botan. Ges. Wien. X. I. 85 (1918). (*Limosina*).

Pusio Zetterstedt: Dipt. Scand. VI. 2496 (1847). (*Limosina*).

Pumilo Zetterstedt: Ins. Lapp. 771 (1838). (*Limosina*).

Septentrionalis Dahl: Berl. Sb. Ges. Natf. Freunder. (1909). (*Limosina*).

Nigricoris Dahl; Berl. Sb. Ges. Natf. Freunde. 375 (1909). (*Limosina*).

Forty seven specimens from the following localities:

Washington: Bellingham, Lake Whatcom, Nahcotta, Lake Cushman, Ilwaco, Granite Falls, Sultan, La Center, Tacoma,

Vancouver, Colby, Dungeness, Pt. Gamble (Melander).

Idaho: Lake Waha (Melander).

Oregon: Salem, Portland (Melander).

California: Berkeley, Muir Woods (Melander).; Stanford Univ. (Aldrich); Redwood City.

British Columbia: Abbotsford (Melander).

Leptocera (Opacifrons) convexa n. sp. (Fig. 9).

Opaque black. Front with fronto-orbital, the very narrow interfrontal stripes and the frontal triangle from lower ocelli to frontal lunule, slightly gray dusted, somewhat flat, two-thirds as long as broad; vertical and postorbital bristles moderate; fronto-orbital bristles divergent, the upper but little longer than the lower; orbital setulæ present, the upper two pairs quite distinct; interfrontal bristles in four pairs, the first from above, very weak, the second reaching the median line and the third and fourth pairs longer and cruciate; one pair of interfrontal setulæ present; face and cheeks yellow, pollinose; check black toward occiput, narrow, from mouth margin to lower margin of eye, equal to one-fourth eye-height; oral vibrissæ long; oral setulæ weak, in one pair; face concave in profile; epistome slightly projecting; clypeus very narrowly visible from in front; antennæ divergent, third joint rounded; arista three times antennal length, long pubescent. Mesonotum and scutellum grayish dusted; mesonotum with a single pair of dorsocentral bristles; acrostichal setulæ rather weak, arranged in six rows between the dorsocentrals, the posterior pair of middle acrostichals longer than the others; pleural sutures yellow to reddish; sternopleuræ with two bristles, the posterior longer than the anterior; scutellum quadrangular; disc with four nearly uniform bristles on margin. Legs hairy; coxæ, trochanters and tarsi infuscate; middle femora with a row of five anterior preapical bristles, the one nearest apex much the longest, middle tibiæ with no flexor and three extensor bristles arranged as follows: one at basal third, one at apical third, and one on apical fifth, hind metatarsi three-fifths as long as second

joint. Wings slightly browned; veins brown; costa ending beyond third vein, first and second sections black, second section three-fifths as long as third; last section of second vein two and one-half times as long as basal section of third vein; penultimate sections of third and fourth veins subequal and twice the length of the outer crossvein; last section of third vein straight and ending a little before wing-tip, last section of fourth vein evanescent and not reaching wing-margin; fifth vein traceable one-half way to wing-margin from outer crossvein. Abdomen cylindrical; second segment of abdomen one and one-fourth times as long as third; hypopygium large. Halteres with stem and tip of knob yellow. Length: 1 mm.

Type.—Male, Bovill, Idaho (Melander).

Paratypes.—Five specimens from the following localities:

Washington: Sultan, Mt. Constitution, Tacoma, (Melander).

Idaho: Priest Lake (Melander).

Pteremis Rondanis.

Rondani: Prodr. I. 124 (1856)., Coprom. Bull. Soc. Ent. Ital. XII 41 (1880).

Duda: Abhand. zool.-bot. Ges. Wien X. I. 28 (1918).

Head large, broader than thorax; wings rudimentary; costa extending considerably beyond third vein; outer crossvein absent; last section of third vein straight or but slightly curved up; preapical bristle present; middle tibiæ with a number of minute apical bristles, never with a single strong, apical bristle; middle metatarsal bristle absent.

Genotype.—*P. nivalis* Haliday.

Species of Pteremis Rondani.

1. Wings very short. not reaching beyond the second abdominal segment; second vein incomplete, not reaching costa; face and cheeks piceous, concave in profile; shining black species. Fig. 3 *parvipennis* n. sp.
- Wings longer, reaching the fourth abdominal segment. 2

2. Front, face and cheeks entirely ferruginuous or yellowish; second section of costa less than one-half as long as third; halteres slightly reduced, fuscous. Fig. 5.....

flavifrons n. sp.

- Front, face and cheeks for the most part black; face slightly carinate, concave in profile; second section of costa a little shorter than third; halteres considerably shortened, yellow. Fig. 2.....

unica n. sp.

Leptocera (Pteremis) parvipennis n. sp. (Fig. 3).

Shining black. Front almost twice as broad as deep; divergent stripes opaque; bristles of front and vertex moderately strong; interfrontal bristles in five pairs, the upper two and the lower pair very much reduced, the other two considerably longer but not cruciate; antennæ piceous; arista two and one-half times antennal length, with short dense pubescence; face and cheeks piceous; face carinate between the antennæ only; epistome curved up on anterior margin; clypeus broadly visible from in front; cheeks a little less than one-third as high as eye, when measured at vibrissal angle; vibrissæ strong. Mesonotum and scutellum with some brownish pollen; dorsocentral bristles in two pairs, the anterior pair rather weak; acrostichal setulae few, in five irregular rows between the anterior pair of dorsocentral bristles; scutellum triangular with apex truncate; marginal bristles four, the posterior pair much longer than the others; pleuræ reddish below; upper sternopleuræ with a strong bristle. Legs with coxæ, trochanters, knees and tarsi reddish; front femora with some long hairs, middle tibiae with two small extensor bristles on apical third; front and hind tarsal joints slightly thickened; hind metatarsi as thick as apex of tibiae and two-thirds as long as next joint. Wings very short, not reaching beyond the second abdominal segment, brownish; veins heavy, piceous; costa ciliate its entire length and ending at third vein; second vein not reaching wing-margin and ending at a point opposite anterior crossvein; posterior crossvein absent. Abdomen very broad; dorsum hairy; segments equal. Halteres considerably reduced. Length 1.5 mm.

Type.—Female; Kukak Bay, Alaska. July 4, 1899, (Kincaid).

Paratype.—A single specimen from the same collection.

Limosina (Pteremis) flavifrons n. sp. (Fig. 5).

Shining black species with head almost entirely reddish yellow. Front rather flat, three-fourths as deep as broad; bristles black; vertical and occipital bristles strong; interfrontal bristles very much reduced, in three pairs; antennæ widely divergent, slightly browned, second and third joints nearly equal; arista pubescent, three times as long as antennæ; face tuberculate between and below antennæ, slightly concave in profile near anterior margin; clypeus broadly visible from in front; cheeks one-third as high as eye when measured at vibrissal angle; oral vibrissæ well developed; buccal and oral setulæ minute; eyes piceous, two-thirds as wide as high. Mesonotum with two pairs of dorsocentral bristles, posterior pair of middle acrostichals longer than the others; scutellum trapezoidal; marginal bristles four; pleuræ opaque piceous; upper sternopleuræ with a rather distinct bristle. Legs piceous with front coxæ, front and middle trochanters, front femora and all tarsi ferruginous; front femora slightly swollen; middle femora with a single preapical anterior bristle, middle tibiæ with three extensor, two on basal third and one on apical third; hind metatarsi but little thickened, two-thirds as long as next joint. Wings slightly smoky extending a little beyond the fourth abdominal segment; veins brown; costa setulose on first section, second section less than one-half as long as third; second vein reaching margin of wing at a point slightly anterior to the inner crossvein; basal section of third vein slightly longer than last section of second vein; inner crossvein very narrow; fourth vein produced a short distance beyond inner crossvein; outer crossvein absent; last section of third vein straight, ending at wing-tip. Abdomen longer than thorax; segments equal; dorsum minutely pubescent. Halteres fuscous, slightly reduced. Length: 1.25 mm.

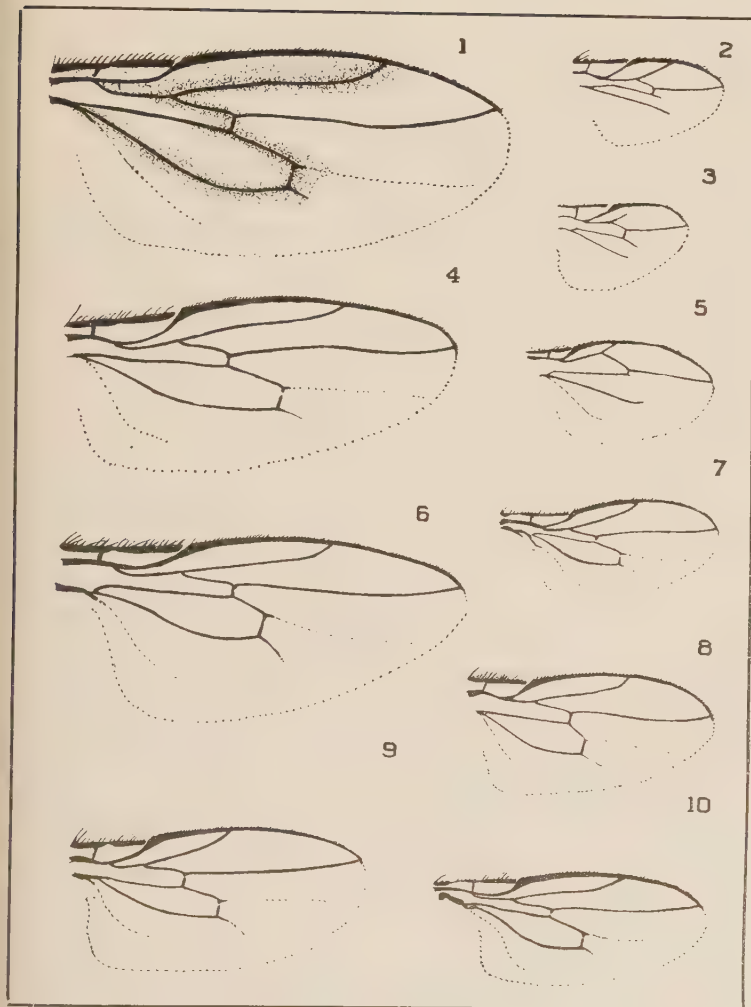
Holotype.—Female: Falls Church, Virginia, Dec. 29, (Barber.) This specimen has been returned to the U. S. National Museum.

Leptocera (Pteremis) unica n. sp. (Fig. 2).

Subshining black. Front slightly reddish, much broader than deep; the divergent stripes, divided by the broad interfrontal stripes, opaque velvety black. (The poor condition of the head of this specimen makes it impossible to give the location of the bristles), third joint of antennæ reddish; face slightly carinate, concave in profile, with a slight reddish tinge; epistome curved up on its anterior margin; clypeus broadly visible from in front; cheeks at vibrissal angle, nearly one-half as high as eye; vibrissæ much reduced. Mesonotum with three pairs of dorsocentral bristles, the anterior two pairs very much reduced and rather indistinct; acrostichal bristles few, in five irregular rows between the anterior pair of dorsocentrals; scutellum triangular; disc bare; marginal bristles four; pleuræ reddish; upper sternopleuræ with a prominent bristle. Legs with coxæ and trochanters yellowish; knees, apices of tibiæ and tarsi reddish; bristles of legs very much reduced; hind metatarsi thickened, two-fifths as long as next joint. Wings brownish, reaching to the middle of fourth abdominal segment; veins brown; costa ciliate for its entire length and ending at third vein, second section distinctly shorter than third; last section of second vein twice as long as basal section of third vein; inner crossvein narrow; outer crossvein absent. Abdomen glossy black, rather long and narrow, tapering posteriorly. Halteres considerably reduced, yellow. Length: 1.25 mm.

Holotype.—Female; Yellowstone National Park, Wyo. (U. S. N. M.)

This single specimen has been returned to the National Museum.



SPULER—OPACIFRONS AND PTEREMIS.

Fig. 1. *Opacifrons grandis* n. sp.; Fig. 2. *Pteremis unica* n. sp.; Fig. 3. *Pteremis parvipennis* n. sp.; Fig. 4. *Opacifrons wheeleri* n. sp.; Fig. 5. *Pteremis flavifrons* n. sp.; Fig. 6. *Opacifrons caelobata* n. sp.; Fig. 7. *Opacifrons coxata* Stenh.; Fig. 8. *Opacifrons pellucida* n. sp.; Fig. 9. *Opacifrons convexa* n. sp.; Fig. 10. *Opacifrons sciaspidis* n. sp.

A GYNANDROMORPH OF *TETRAMORIUM GUINEENSE*
FABR.

By WILLIAM MORTON WHEELER.

Bussey Institution, Harvard University.

Mr. P. H. Timberlake has had the kindness to send me a very interesting gynandromorph of the common tropicopolitan ant, *Tetramorium guineense* Fabr., which was captured June 19th, 1923 by Mr. E. H. Bryan on Necker Island, some miles northwest of Honolulu. Unlike the previously recorded ant-gynandromorphs, this insect is a pure example of the antero-posterior type, the head being male, the remainder of the body female, with perfectly developed wings (Fig. 1a). I can detect no deviation in the structure of the head (Fig. 1b) from that of the normal male. The antennæ are perfectly developed and 10-jointed, and the details of the sculpture, pilosity and color of the normal male are accurately reproduced. The head of the normal female, shown in Fig. 1c, is, of course very different. The thorax, however, is precisely like that of the normal female, except that it is slightly less robust, with the mesonotum a little less flattened dorsally, and the metasternal spines are undeveloped. The thorax of the male *guineense* is very different from that of the female, since it lacks the epinotal spines as well as the metasternal spines, has a more convex mesonotum and mesosternum and the former has Mayrian furrows. The color is also darker and the surface much smoother and very differently sculptured from that of the female. The legs, petiole, post-petiole and gaster of the gynandromorph are precisely as in the normal female, even the sting, which is fully exerted, being of the same length and structure. The sculpture, pilosity and color are also as in the normal female, the thorax, legs and pedicel being yellowish ferruginous, the gaster very dark brown or blackish, with its extreme base and tip yellowish brown. There is every reason to assume that the internal reproductive organs are those of the normal female. The wings are whitish hyaline, with colorless veins and pterostigma, as in the normal female.

On looking over the specimens of *Tetramorium guineense* in my collection I find one male from Cagues, Porto Rico with

an 11-jointed left antenna. The right antenna is broken so that the number of its joints cannot be ascertained. This and similar specimens, which one finds occasionally in *Tetramorium* and other ant-genera, are probably to be regarded as exhibiting "intersexual" rather than gynandromorphic traits since in the case mentioned the number of antennal joints is intermediate between the ten of the normal male and the twelve of the normal female.

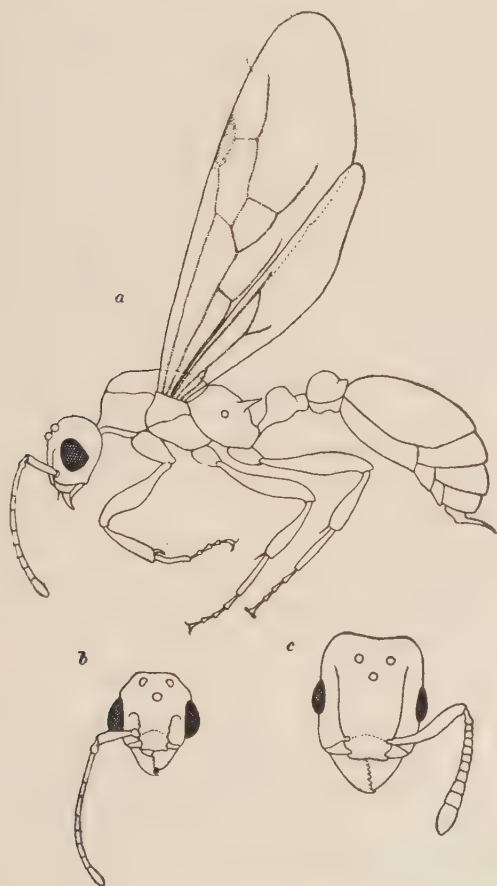


Fig. 1. Gynandromorph of *Tetramorium guineense* Fabr. a, lateral view; b, anterior view of head; c, head of normal female.

ATTACKS OF *VESPA COMMUNIS* DE SAUSSURE ON
HYPHANTRIA CUNEA DRURY.

BY M. T. SMULYAN.

U. S. Bureau of Entomology, Melrose Highlands, Mass.

The wasp attacks reported here occurred during September 1923, at Roycefield, N. J., and were made on fall webworm larvæ (*Hyphantria cunea* Drury) which had been collected in a number of localities for parasite study purposes. The wasps (*Vespa communis* De Saussure)¹ appeared, suddenly and in large numbers, as the first collection of the webworms was being examined out of doors, and they literally threw themselves upon the caterpillars, and their attacks were so persistent and savage that all efforts to drive them off, although it resulted in the death of many of them, were fruitless. The attacks began very early in the month, and they were continued at intervals—in connection with each out of door examination of the webworms—throughout the ten-day collecting period. Attacks upon the caterpillars were made also while they were in a more or less open, near-by shelter, where they had been placed in rearing trays, and the wasps exhibited the same degree of ferocity and voracity here. They attacked here not only at the feeding of the caterpillars, when the trays were uncovered, but throughout the greater part of the day—through the screen covers—whenever caterpillars appeared on the undersides of the latter; and they continued this, although in decreasing numbers, until the last week of September when following a two or three day period of cold weather they disappeared altogether.

The wasps, it should be added, apparently made no attempts to carry off the caterpillars. Nor, as far as could be seen, did they malax them. They would precipitate themselves upon them, pierce the integument with their mandibles, and consume the liquid and softer parts.

¹Determined by Dr. J. Bequaert of the Harvard University Medical School, on the return of the writer to Melrose Highlands, Mass.

The wasps were not seen to attack insects prior to the attacks reported here, although individual workers were observed from time to time in the vicinity throughout the summer. But very likely they were at those times merely seeking food of vegetable character. The fondness of adult wasps for this type of food is well known of course, and their indifference to animal food at times of the abundance of the former has been noted.

The behavior of the wasps—aside from their apparent failure to carry off or to malaxate the caterpillars—may probably be explained on the ground of a shortage or dearth of food—both plant and animal—because of the lateness and dryness of the season; the summer of 1923 was exceedingly dry in New Jersey. The suggestion (which has been made) that the wasps' ferocity and rapid consumption of the liquid portions of the caterpillars were perhaps due to a desire for water—the fondness or need of wasps for water is also well known—is hardly satisfactory. First, there was available the water from the heavy dews; secondly, the wasps continued to seek the caterpillars in the rearing trays in the shelter, although in smaller numbers, during a two-day rain-storm. It was hunger, evidently, rather than thirst which influenced the wasps.

The exact location of the wasp nest was not discovered.

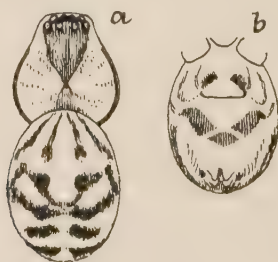
NEW SPIDERS FROM SOUTHERN NEW ENGLAND.

J. H. EMERTON.

The following species of spiders have been found in the last few years in southern Massachusetts, Rhode Island and Connecticut. The *Grammonata* was at first considered a variety of *G. pictilis*, but has now been found in three different places, always with the same distinguishing characters. The *Ceratinopsis* is one of several species confused under the name of *C. nigriceps*. The *Euryopsis* has been known for a long time, but has awaited description in the hope of finding females that might be referred to the same species. The *Theridion* and the *Lophocarenum* are described reluctantly from single specimens after careful search for more in the same localities.

Theridion terrestre n. sp.

3 mm. long, pale, with very distinct gray and black markings. The cephalothorax has a middle gray stripe as wide as the eyes in front, narrowing backward to the dorsal pit and widening again behind. The thoracic part is bordered by a narrow black line. The femora and tarsi have three gray rings. The abdomen

Fig. 1. *Theridion terrestre* n. sp.

has a complicated black pattern composed of two rows of spots in the middle, partly connected with two lateral rows in the anterior half. Fig 1a. On the under side there is a middle

transverse marking composed of three gray spots, and there are indefinite gray marks along the sides. Fig. 1, b. The legs are long and slender, as usual in this genus, the fourth leg is 8 mm. long. The front legs, probably the longest, are broken off and lost.

One female only among weeds in an asparagus field. Holliston, Mass. N. Banks.

***Ceratinopsis tarsalis* n. sp.**

Male 1.5 mm. long. Cephalothorax orange brown, black between the eyes. Abdomen and feet pale. The female is black around the eyes like the male, but does not have a sharply



Fig. 2. *Ceratinopsis tarsalis* n. sp.

defined black spot like *C. nigriceps*. The epigynum is distinctly different from that of *nigriceps* and resembles some of the *Lycosidæ*. Fig. 2b. The male palpus has the tibia larger and wider than in *nigriceps*. Fig. 2a. The outer edge of the tarsus is slightly thickened and there is a thicker ridge parallel with it. Fig. 2a.

Buttonwoods, near Providence, R. I., Mouponsett, Middleboro, and Hyannis, Mass.

***Grammonata capitata* n. sp.**

This resembles closely *G. pictilis*, and like it lives in trees. It is one-eighth smaller than *pictilis* and paler in color, the light spots of the abdomen running together so that in some specimens

the whole back is pale except a middle gray mark. Fig. 3a. In the males the cephalothorax is slightly shorter and the hump on the head rises more abruptly behind. Fig. 3b. The male palpi and the epigynum cannot be distinguished from those of *pictilis*.

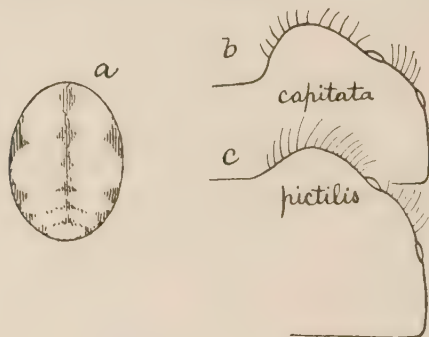


Fig. 3. *Grammonata capitata* n. sp.

Amston, Conn., Miss Bryant. Chatham, Mass. and Holiston, Mass. At Chatham both this species and *pictilis* have been found, but in localities a mile apart.

Euryopsis spinigera Cambridge.

Biologia Centrali Americana, Arachnida, Vol. 1, page 146, plate 19, fig. 2.

Males only known, 1.5 to 2 mm. long, yellow brown with a darker thickened spot covering the back of the abdomen except the posterior end. Fig. 4a. On the under side of the abdomen are two large thickened spots, one covering the anterior end as far back as the spiracles and the other occupying the middle of the posterior half. Fig. 4b. Smaller thickened spots are scattered along the sides. The upper side of the abdomen is covered with scattered stiff hairs. Fig. 4a. The legs are short and without any markings. The cephalothorax is as wide as long and narrowed toward the head. The upper eyes as seen from above

form a straight line. The lateral eyes of the front row nearly touch those of the upper row. The middle eyes are much lower and twice their diameter apart.

The male palpi have the patella and tibia very short, the tibia widened at the end covering the base of the tarsus. Fig. 4 c. d. The tarsus is oval and the palpal organ very simple with a short tube supported by a slightly longer and wider process. Fig. 4c.

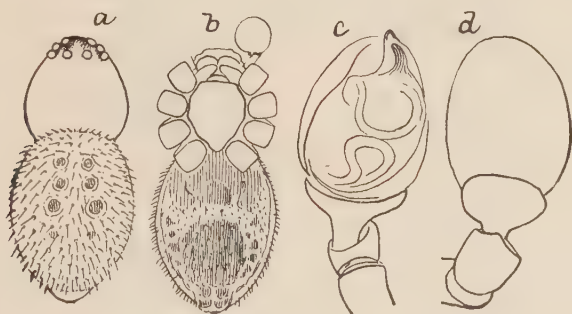


Fig. 4. *Euryopsis spinigera* Camb.

Chatham, Mass., June 10, 1919. Riverhead, L. I., Sept., walking on railroad track, C. R. Crosby. Charleston, S. C., J. H. Emerton. The specimen described by Cambridge was from Guatemala.

***Lophocarenum hortense* n. sp.**

A large and light colored species, 3 mm. long. Cephalothorax light orange brown, legs and palpi pale yellowish; abdomen yellowish white with fine gray hairs. The general appearance is like *L. domiciliarum*, Em. which has been found only once. The head is low and has very small grooves and shallow pits just behind the eyes. Fig. 5a. The male palpi have patella and tibia both short. The tibia is as wide as long and has only short projections on the front edge. Fig. 5b. The tarsus is short and almost round. The palpal organ is shown

in Fig. 5c. The principal process has the end curved over in a double hook which nearly meets a sharp point branching from below.

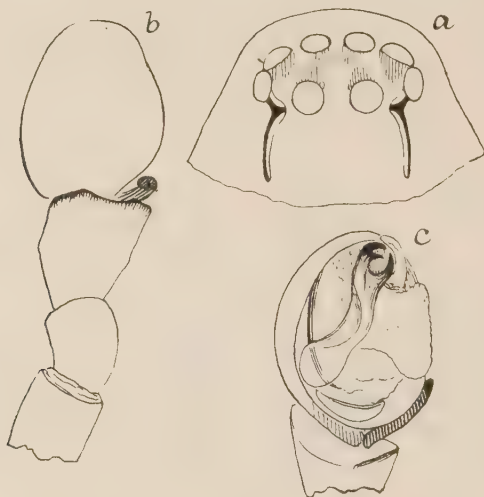


Fig. 5. *Lophocarenum hortense* n. sp.

One male only from weeds in an asparagus field, Holliston, Mass. N. Banks.

***Clubiona agrestis* n. sp.**

4.5 mm. long. Cephalothorax 2 mm. long, the head a little more than half as wide as the thorax and only slightly darker in color. In general, it resembles *C. spiralis*, but is distinguished from it by the palpal characters. The tibia of the male palpus has two hooks on the outer side of about the same size. Fig. 6a.

The palpal organ has the hard process on the under side blunt with several short teeth on the inner side as shown in Fig. 6b.

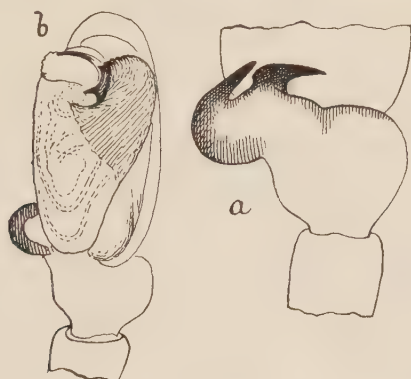


Fig. 6. *Clubiona agrestis* n. sp.

Holliston, Mass., June 17; one mature male and one just molted.

THE FAMILY POSITION OF GRAPHELYSIA (LEPIDOPTERA)

BY WM. T. M. FORBES.

Ithaca, New York.

Graphelysia Hampson (Annals and Magazine of Natural History (8) vol. 8, p. 408, 1911) was based on *Elysius strigillata* Rothschild, described as an Arctiid. Its position in the Arctiidæ has been unchallenged, and it appears in the Supplement to the Catalogue of Lepidoptera Phalænæ, vol. 2, page 337.

The Cornell Entomological Expedition of 1919-1920 captured two specimens, a female from Corumba, Matto Grosso, Brazil, Dec. 1919, and a male from Urucum, in the vicinity of Corumba, Dec. 23, making a considerable extension of the distribution, as the species was described from southern Peru.

The form is undoubtedly a *Noctuid*, not an Arctiid, as shown both by the venation and by the tympanum, which is of a type unknown in the Arctiidæ. It will find a place in the Acontianæ, as defined by Hampson, but is abundantly distinguished by the combination of conical front and stalked R_2 (vein 10); in fact it is not close to any known genus. The antenna is pectinate in both sexes, an extraordinary character in the quadrifid Noctuidæ, the frenulum hook of the male distinctly longer than wide, though far from having the slenderness typical of Acontianæ, the female frenulum of three strong bristles. At the base of the hind wing Sc is moderately thickened, and R is weak but free, fusing with Sc for a short distance only; M_2 is well developed, and distinctly cubital, though well separated from M_3 at the origin. On one side of the male specimen Sc and R though closely approximate are not actually fused, and M_2 arises from the middle of the end of the cell, though the other side, like the female, is normal. The tympanum is like no other form I have seen; without dissection it is not possible to make it out fully, but the alula is deeply fringed with loose hair, not forming the scaly cap frequent in the Acontianæ, the hood

on the first segment of the abdomen is weakly developed, and encloses the spiracle as in other Acontianæ, and entirely unlike the deep subdorsal hood of the Arctiidæ, the tympanic membrane itself is high up and far back, practically on the level of the wing, and is not well set off from the articular membrane before it. The epimeron proper is unusually short and squarish, exaggerating a character found in other Acontianæ. The hind leg is also of an Acontiine type, being swollen and hairy, with end-spurs only, and with a swollen and somewhat flattened metatarsus.

Altogether the connection with the Acontiine Noctuidæ is unmistakable, though no genus known to me is at all close. The female does not differ in any striking way from the male.

SEX OF ADULT CECIDOMYIDÆ (OLIGARCES sp.)
ARISING FROM LARVÆ PRODUCED
BY PÆDOGENESIS.

REGINALD G. HARRIS.

Brown University.

Communicated from the Biological Laboratory, Cold Spring Harbor, Long Island.

The question of the sex of adult forms arising from parthenogenetically and pædogenetically produced individuals has called forth some debate and speculation, often in the absence of suitable date. Sturtevant (1923) summarized the evidence then available concerning some of the Chironomidæ and Cecidomyidæ in the following statements.

"Parthenogenesis has been described in the Chironomid genera *Chironomus*, *Corynoneura*, and *Tanytarsus* by Grimm (1870) Johannsen (1912), Goetghebuer (1913), Edwards (1919) and others. Eggs are produced in some cases by the larvæ, in others by the pupæ, and in still others by the imagines. In all cases in which imagines have been produced by parthenogenetic (including pædogenetetic) lines, these have been females and have bred parthenogenetically if at all. Males are known to occur in these genera, and in one case even in a species that reproduces parthenogenetically; but in no case are males reported as arising from larvæ known to have been produced by parthenogenesis.

"The first case of parthenogenesis recorded among the Diptera was that of the Cicidomyiid, *Miastor*, discovered by Wagner (1863). In this case it is the larvæ that reproduce parthenogenetically. Imagines are often produced, but when they do appear both sexes are found (Meinert 1864, Wagner 1865, Kahle 1908). Kahle states that there is a significant excess of females, and Felt (1911) describes only the female, though he does not state that males were absent. It is not known whether the imagines breed at all, or not; Kahle states that he did not

observe copulation. It does not appear to have been entirely proven that the males arise from larvæ that have been produced by pædogenesis, though most students of *Miastor* have apparently taken this for granted without making cultures from isolated larvæ."

This latter objection has been removed by the writer, who, in using *Miastor* and *Oligarces* as material for experimental work, has, for some time, made cultures from isolated larvæ, and maintained them on artificial culture media. The methods, and some of the results of this work have been reported already. A suitable method of cultivation of *Miastor metraloas* on an artificial culture medium was found (Harris 1923, 1, 2). This method was improved and simplified in later work on *Oligarces* (Harris 1923, 3). Both of these methods remove the possibility of contamination of the culture by other larvæ than those under observation. The data contained in this report are taken largely from the work on *Oligarces*.

Cultures of pædogenetic larvæ of *Oligarces*, if kept in darkness at a suitable temperature, are easily maintained in Petri dishes in the laboratory, on the following culture medium; 0.5 per cent malt extract, 2 per cent agar agar, 97.5 per cent water. Thus the difficulty of making cultures from isolated larvæ is greatly lessened. It may be said, however, that in making cultures from isolated pædogenetic larvæ it is advisable to take a mother larva containing nearly full term embryos, as cultures made from an individual larva are more liable to be unsuccessful than those in which several larvæ are present. By using a mother larva containing embryos about to be born, one is assured of starting a culture from an isolated larva, while, at the same time, providing the new colony, almost immediately, with several young larvæ with which to carry on the strain. Similar results may be obtained by freeing full term embryos from the skin of the mother larva by dissection in water on a microscope slide, and then transferring these young of an isolated mother to a new culture. Both of the foregoing methods are recommended as time-saving, and as productive of well established colonies.

I have previously reported (Harris 1923, 3, 1924, 1) that pupæ and adults can be produced at will in the laboratory by maintaining a crowded condition in the previous generation. Pupæ and adults produced in this way were used as material for the present study. These pupæ and adults arose in all cases from pædogenetic stock, taken in nature, and maintained on artificial culture medium in the laboratory. In no case are data given on cultures which did not pass at least one pædogenetic generation in the laboratory previous to the appearance of pupæ-larvæ. In some cases the data concern mass cultures. In other cases cultures which originated from an isolated pædogenetic mother larva.

It was found that the pupæ and adults which appeared in mass cultures, made from pædogenetic larvæ of pædogenetic origin, were as likely to be males as females. Thus in cultures B₁₂ and C₁₂ of 28 pupæ, chosen at random and sexed, 18 were males and 10 were females. In culture M79, of 2 adults, 1 was a male, 1 a female. A similar sex ratio was observed in culture MNO 340.

All of these cultures were originally made of varying numbers of isolated pædogenetic larvæ of known pædogenetic origin. Thus it is clear that male as well as female pupæ and adults arise from larvæ which have been produced by pædogenesis. Male pupæ, when dissected, were found to contain large numbers of sperms in the gonads, while in the female usually about four or five large eggs are visible in living specimens. It seems likely then that both males and females are functionally as well as morphologically different. Up to the present time, however, I have not attempted to obtain progeny from adults, and so cannot state whether or not copulation can be easily obtained in the laboratory.

Whether the number of males will be equal to or greater than the number of females, or *vice versa*, in a given culture, was shown to depend upon the type of stock which was selected in making the cultures, for it appears that in the same colony in nature certain pædogenetic larvæ belong to male producing strains, while other larvæ constitute female producing strains.

Thus in the eighth generation of material originally taken from a single colony in nature, and maintained in the Laboratory by the means already described, individual 4XX was segregated and transferred to a fresh culture made of the standard medium. In the third filial generation pupæ and adults appeared as a result of crowding in the previous generation (F_2). All of these pupæ and adults, 38 in number, which were sexed were females. In the fifth filial generation of the same strain, pupæ and adults again appeared under similar conditions, in three separate cultures. In culture M222, 26 pupæ and adults were sexed. All were females. This was equally true for the 23 individuals sexed in culture M223, and for the 59 individuals sexed in culture M224. Thus all of the 108 F_5 pupæ and adults which were sexed were females. It is apparent that the progenitor of this strain, individual 4XX, must have belonged to a female-producing strain, since all of the pupæ and adults produced by her offspring, both in the F_3 and F_5 generations, were females.

Conversely, at the same time, and under similar conditions, individuals of other strains of known pædogenetic origin, gave rise to male pupæ and imagines only. Thus in culture MN320 5 pupæ appeared; all were males. Similarly in culture CO₂3 five adults arose from an isolated pædogenetic mother of known pædogenetic origin. These five adults were males.

Male pupæ of *Miastor metraloas* appeared in a colony, maintained in decayed birch, wood in the laboratory in Paris (Prof. Maurice Caullery, Director) under crowded conditions in a tin box. Though these did not arise from larvæ all of which had been carefully segregated and examined, the fact that they appeared some two months after the material had been transferred to the laboratory makes it more than probable that they were produced by larvæ which had arisen pædogenetically from pædogenetic larvæ originally present in the material. This conclusion is further supported by the fact that all pædogenetic larvæ which were examined and segregated reproduced pædogenetically under similar conditions, about 2 weeks after birth. This would allow for four laboratory pædogenetic generations before the appearance of the male pupæ.

Table 1.

Sex of Imagines and Pupae produced by Paedogenetic Larvae of Known Paedogenetic Origin.

Culture	Pupae arose by	No. of ♀ ♀	No. of ♂ ♂	Total	Per Cent of ♂ ♂
A. .					
B ₁₂ , C ₁₂	crowding	10	18	28	64.3
M79	crowding	1	1	2	50.0
MNO 340	crowding	1	1	2	50.0
B. Female-producing strain.					
4XXF ₃	crowding	38	0	38	0.0
4XXF ₆ (M222)	crowding	26	0	26	0.0
4XXF ₆ (M223)	crowding	23	0	23	0.0
4XXF ₆ (M224)	crowding	59	0	59	0.0
X8F ₂	crowding	1	0	1	0.0
C. Male-producing strains.					
MN320	crowding	0	5	5	100.0
CO ₂ 3	CO ₂	0	5	5	100.0

All cultures were maintained on the standard artificial culture medium, described earlier in this paper, under as nearly identical external conditions as possible, save culture CO₂ 3. The mother of the five imagines which appeared in this culture was treated with carbon dioxide at birth, and for some time subsequently, after which she was transferred to the standard medium employed in these studies. In all cases cultures were maintained in closed boxes in the same incubator, thus being exposed to similar conditions in respect to temperature, humidity, and light, as well as food. Thus the conclusion seems warranted that the observed sex-ratios are the expression of an internal mechanism, which, in the present instance in all probability, has not been greatly affected by external conditions (save possibly in the case of the strain produced by the paedogenetic mother larva which was treated with carbon dioxide.) Sufficient data are not yet at hand to warrant a statement concerning whether or not the carbon dioxide treatment changes the sex-ratio as in *Cladocera* (Banta 1923).

Summary.

Males as well as females arise from mass cultures of larvae that have been produced by paedogenesis in *Oligarces* sp.

But males and females are not produced by the same individual, under normal conditions.

In the descendants of members of a colony taken from nature there were found to be two types of pædogenetic larvæ in respect to the sex of pupæ and adults which they produced, (1) male-producing, and (2) female-producing.

These two types of pædogenetic larvæ are not morphologically distinguishable.

The evidence indicates that the distinction is genetic, since it holds not only in the case of a given individual, but also, without observed exception, in its offspring through five generations of pædogenetic reproduction in two of which certain numbers of adult forms were produced.

Thus the potentiality for producing only males or only females seems to be inherited; there existing in the colony male-producing and female-producing strains.

LITERATURE.

- Banta, A. M. and Brown L. A., 1923. Further control of sex in a species of Cladocera. Anat. Rec. Vol. 24, Abs. 144 p. 420.
- Edwards, F. W. 1919. Some Parthenogenetic Chironomidæ. Ann. Mag. Nat. Hist. (9) 3; 222-228.
- Felt, E. P. 1911. *Miastor americana*. An account of pedogenesis. New York State Mus. Bull. 147; 82-104.
- Goetghebuer, M. 1913. Un cas de parthénogenèse observé chez un Diptère Tendipédide (*Corynoneura celeripes*). Bull. Acad. Roy. Belgique. 1913, 231-233.
- Grimm, O. 1870. Die ungeschlechtliche Fortpflanzung einer Chironomus-Art und deren Entwicklung aus dem unfruchteten Ei. Mem. Acad. Imp. Sci. St. Pétersbourg sér. 7, tome 15.
- Harris, R. G. 1923, 1. Sur la culture des larves de Cecidomyides pædogenétiques (*Miastor*) en milieu artificiel. Comptes Rendus Soc. de Biol. Paris, Tome 88 p. 255-7.
- Harris, R. G. 1923, 2. Occurrence, Life-cycle, and Maintenance under Artificial Conditions of *Miastor*. Psyche Vol XXX. p. 95-101.

- Harris, R. G. 1923, 3. Control of the Appearance of Pupa-larvæ in Pædogenetic Diptera. Proc. Nat. Acad. Sci. Washington, Vol. 9-407-413.
- Harris, R. G. 1924, 1. Further Data on the Control of the Appearance of Pupa-larvæ in Pædogenetic Cecidomyidæ. (*Oligarces* sp.) in press.
- Harris, R. G. 1924, 2. Reversal of Function in a Species of *Oligarces* (in press).
- Johannsen, O. A. 1912. Parthenogenesis and Pædogenesis in *Tanytarsus*. Maine Agr. Exp. Sta. Bull. 187; 3-4.
- Kahle, W. 1908. Die Padogenesis der Cecidomyiden. Zoologica, Bd. 21. Heft. 55. 80 pp., 6 plates.
- Meinert, F. 1864. Weitere Erläuterungen über die von Prof. Nic. Wagner beschriebene Insectenlarven, welche sich durch Sprossenbildung vermehrt. Zeits. wiss. Zool. 14; 394-399.
- Sturtevant, A. H. 1923. The Probable Occurence of Parthenogenesis in *Ochthiphila polstigmata*. (Diptera). Psyche vol. XXX 22-27.
- Wagner, N. 1863. Beitrag zur Lehre von der Fortpflanzung der Insecten-larven. Zeits. wiss. Zool. 13. 513-527.
- Wagner, N. 1865. Ueber die viviparen Gallmückenlarven. Zeits. wiss. Zool. 15, 106-107.

Acknowledgement is made to Dr. C. B. Davenport for facilities offered in connection with this work at the Department of Genetics of the Carnegie Institution of Washington at Cold Spring Harbor.

NEW AND UNRECORDED AMERICAN SPECIES OF
THE FAMILY PHORIDÆ (DIPTERA)¹

BY CHARLES T. BRUES.

The present short paper includes descriptions of three new species of Phoridae of the genera *Hypocera* and *Aphiochæta* and records of the occurrence in North America of two European species, *Gymnophora quartomollis* Schmitz and *Aphiochæta giraudii*. I am greatly indebted to Dr. C. F. Adams by whom two of the new species were collected, and who has graciously allowed the types to remain in the writer's collection.

***Hypocera* Lioy.**

In this genus there is a group characterized by having the vertex semicircularly elevated and sharp above. The first species of this type to be described was *H. coronata* Becker from Europe, but several others have since been added. In the present collection made by Dr. Adams is another species from the United States. It may be distinguished from the other members of this group as follows:

1. Ocelli forming a distinct triangle, the lateral ones as far from the eye-margin as from the anterior ocellus, antennæ and palpi black.....(Europe) *coronata* Becker.
Ocelli forming a curved line, the lateral ones separated from the eye by only about their own diameter.....2
2. Third vein bare, except for a few bristly hairs near base; wings hyaline.....3
Third vein hairy for its entire length; wings tinged with brown.....(Europe) *ocellata* Schmitz.
3. Bristles near base of middle tibiæ opposite one another; forming a pair at the basal third; median bristles of lower frontal row nearer to one another than to the lateral bristle; tip of first vein midway between tip of costa and humeral cross-vein.....4

¹Contribution from the Entomological Laboratory of the Bussey Institution Harvard University, No. 238.

- One of the bristles much nearer to the base of the tibia 5
4. Antennæ and palpi orange-yellow; third joint of male antenna fully as long as the width of the front; front tarsus of male greatly dilated, the second and third joints as broad as long. (North America) *johnsoni* Brues. Antennæ black, palpi yellow; third antennal joint of male considerably shorter than the width of the front; front tarsi of male less broadly dilated, the second and third joints decidedly longer than broad. (North America). *adamsi* sp. nov.
5. Front wider than high; bristles of middle tibia at basal third and basal fourth respectively; the middle row of frontal bristles curved upwards medially. (South America) *insperata* Brues. Front higher than wide; bristles of middle tibia at basal third and before middle respectively; middle row of frontal bristles straight. (Formosa) *suspecta* Brues.

Hypocera adamsi sp. nov.

♂. Length 2.7 mm. Very robust; black, with only the palpi, front legs beyond the middle of the femora, and four posterior knees brownish yellow. Wings hyaline, venation dark brown. Front with a transverse carina below the median ocellus; above this highly polished and concave; ocellar bristles equidistant, the median pair larger and set midway between the ocellar carina and the upper margin of vertex; front below the carina shining, covered with sparse setigerous punctures; lateral bristles of lower row close to the eye, well above the median pair and farther from the median ones than the latter are from one another; upper row straight, its four bristles equidistant, the lateral one close to the eye; cheeks each with one long bristle. Antenna pyriform, the axis curved so that the top is slightly concave in profile; densely brown pilose; arista one-third longer than the third joint. Eyes not distinctly pilose; postocellar cilia strong, slightly longer above. Palpi small, compressed; with strong bristles, the apical one as long as the

palpus. Thorax above and upper part of mesopleura very shining, clothed with fine recumbent bristly hairs which extend down on to the top of the pleura; sides of prothorax also hairy, with two bristles above the coxa and two very large ones below the spiracle. One pair of dorsocentral bristles; two scutellar bristles, the lateral ones reduced to hairs; posterior edge of mesonotum with six small bristles as long as the width of the scutellum. Abdomen above shining, faintly shagreened; sides sparsely clothed with recumbent hairs; second segment almost as long as the four following; sixth as long as the two preceding, clothed with sparse hairs. Legs very stout, the hind femora barely three times as long as wide; front tibia with a long bristle at the basal third, followed by a line of about eight small ones extending to the tip which bears two short spurs; middle tibia with a pair of large bristles at the basal third and two apical spurs, the longer one nearly half the length of the tibia; hind tibia with a single bristle externally just before the middle and with a pair externally at the tip in addition to the two subequal internally placed apical spurs; apex of tibia inwardly with four transverse combs of short bristles. Pleuræ shining, very finely shagreened. Costa extending barely beyond the middle of the wing; its cilia dense, but short, about twice as long as the thickness of the rather slender costal vein; humeral cross-vein distinct, but pale colored; mediastinal absent; first vein ending midway between the cross vein and tip of costa; third vein with several minute bristles at the base, but with no distinct hairs beyond (there are traces of a few minute hairs to be seen with the highest power of the binocular, but none like those seen in the species with this vein hairy); not widened apically; fourth vein originating well below the third, curved at base, straight beyond, ending at the wing tip; fifth and sixth complete, nearly straight; seventh obsolete.

♀. Length 3-3.2 mm. Essentially similar, except for the normal ovate antennæ, with the usual arista and slightly less elevated frontal margin.

Male type and four females paratypes collected by Dr. C. F. Adams at Atherton, Mo., October 4.

Gymnophora Macquart.

Quite recently Schmitz has distinguished four species of this genus from Europe (Jaarb. Naturhist. Genootsch. Limburg, for 1919, p. 132, 1920). All of these have heretofore gone under the name of *Gymnophora arcuata* Meigen, as have also the North American members of the genus. On examining my collection in the light of Schmitz's paper, it is evident that the true *arcuata* does not occur in eastern North America, although I have a single male from Tacoma, Washington (A. L. Melander) which seems to be indistinguishable from a European specimen which according to Schmitz's description and figure is *arcuata*. Like many palæartic forms, it is probable that this one extends into the United States only along the Pacific Coast.

All other specimens, ranging from Kansas to Wisconsin and eastward are apparently *Gymnophora quartomollis* Schmitz (t. c., p. 133).

Aphiochaeta velutinipes sp. nov.

♀. Length 1.7 mm. Piceous, the abdomen above and the front almost black; humeri brown; the pleuræ becoming much lighter below till they are pale brown next to the coxæ, antennæ fuscous; palpi brownish yellow; legs pale brownish yellow on the coxæ but darker beyond, especially the four posterior pairs; wings hyaline, venation fuscous; halteres light brown. Front quadrate, with distinct ocellar tubercle and median frontal groove. Two pairs of proclinate bristles, the lower pair smaller and only two-thirds as far apart as the upper ones; lowest row of reclinate bristles forming a pair at each side of the front with the lateral bristle close to the eye and far above the inner one which is on a line with the lower post-antennal one, and half-way between it and the eye-margin; middle frontal row curved downwards medially, its median bristles farther from one another than from the lateral bristle which is very close to the eye; ocellar row of four. Antennæ small; arista conspicuously pubescent, one-third longer than the width of the front. Palpi of

moderate size, with rather weak bristles. Mesonotum shining, with minute bristly hairs, longer behind and arranged in rather distinct longitudinal rows; one pair of dorsocentral bristles, scutellum broader than long, with four equally strong bristles. Propleura with a vertical band of bristly hairs below the spiracle, a long bristle above it and several bristles near the base of the coxa. Mesopleura bare. Second abdominal segment only one-third longer than the third, not bristly at the sides; fifth segment elongated. Fore tarsi not distinctly thickened, although not quite so slender as usual. Tibiæ finely hairy, but without trace of a dorsal seam or setulæ. Hind tibia with the dorsal surface somewhat expanded and flattened at the tip where it bears several transverse rows of minute comb-like setæ; hind metatarsus strongly spinose below. Costa long, extending distinctly beyond the middle of the wing, its cilia extremely minute and closely placed; first section almost as long as the second and third together; third two-fifths the length of the second; fourth vein strongly bent at the base, straight beyond; fifth with a sharp bend at the middle so that it runs parallel to the fourth; sixth straight; seventh curved, well removed from the margin. The light veins are all unusually thin and delicate.

Type from Atherton, Missouri, U. S. A., collected by Dr. C. F. Adams.

This species is extremely similar to *A. magnipalpis* Aldrich from the Lesser Antilles, and were it not for the peculiar chætotaxy of the front, I should be inclined to consider the two identical, especially as the fifth wing vein has the peculiar bend characteristic of *magnipalpis*. In the West Indian species the frontal bristles show the ordinary disposition, and the inner of the lowest reclinate row is not dropped below the post-antennals.

An examination of my series of *A. magnipalpis* has disclosed another species of this group, also with enlarged palpi in the male, but with normal wing venation. This is described below.

***Aphiochaeta opaciventris* sp. nov.**

♂. Length 1.6 mm. Black, the mesonotum more or less piceous; pro- and mesopleuræ dark brown; front legs dilute piceous, other legs blackish brown. Wings hyaline, venation

very dark; halteres black. Front distinctly broader than long; ocellar tubercle conspicuous; median groove poorly defined; four proclinate post-antennal bristles of nearly equal size; lower ones half as far apart as the upper which occupy one-fourth of the width of the front; inner bristle of lowest reclinate row on a level with the upper post-antennal and midway between it and the eye, lateral one considerably higher and close to the eye; upper row of four bristles strongly bowed downwards medially, the inner bristles separated by one-half the width of the front; ocellar row of four large bristles. Antennæ of moderate size, with the arista densely pubescent and one-half longer than the width of the front. Palpi greatly enlarged, as long as the height of the head and furnished below with very minute scattered bristles; in lateral view they are curved upwards and narrowed apically, less than one-sixth as thick as long; seen from below they curve outward anteriorly and are one-fourth as broad near the base as long. Mesonotum quite shining, sparsely hairy, the hairs more or less bristly behind; with one pair of dorsocentral bristles and several long bristles along the lateral margin. Scutellum slightly wider than long, its hind margin strongly arcuate and bearing four long, equal bristles, forming a pair near each lateral angle. Abdomen opaque, velvety black, the segments all of about equal length and without noticeable bristles along the sides. Hypopygium more or less globose, strongly asymmetrical; nearly bare above, but conspicuously clothed with rather dense bristles below, on the left side and at apex; apical lamella small and with very inconspicuous bristly hairs. Propleura with a dense brush of bristles above, a close-set row along the posterior margin and several longer ones below near the base of the coxa. Mesopleura subshining, without bristles above. Legs quite slender, clothed with fine bristly hairs, but without cilia or setulæ on any of the tibiæ; hind tibiæ each with a single slender apical spur; inwardly near the tip with several very oblique rows of fine comb-like bristles; metatarsus below with five or six similar, nearly transverse rows. Anterior tarsi long and very slender. Costa slightly but distinctly more than half the wing-length, with short dense cilia;

first section barely longer than the other two together; third fully one third as long as the second and as long as the second vein; fourth vein feebly curved on basal half, straight beyond; fifth weakly sinuous on basal half, straight beyond, without a sharp bend before the middle, sixth and seventh nearly straight, the latter faint.

Type from Grenada, B. W. I. (Brues), 1910.

This species is at once distinguished from *A. magnipalpis* Aldrich from the same island, by the much more slender legs, opaque velvety black abdomen, normally curved fifth vein and by the complete absence of any cilia on the middle tibiae. The palpi although similarly enlarged in the male, are more slender than in *magnipalpis*.

A. opaciventris does not closely resemble any European or North American species. Any of these which might be otherwise confused with it have the fore tarsi enlarged.

***Aphiochaeta giraudii* Egger.**

This European species has already been reported from North America by Mrs. Slosson on the basis of specimens determined by Coquillett. It appears that this identification was incorrect, however, and Malloch removed the species from the North American list in 1912.¹

I have a male, however, collected by Mr. C. W. Johnson at Fort Kent, Maine which is undoubtedly this species. The only difference that I can detect is the shorter basal section of the costa which equals but is no longer than the second and third together. The specimen is rather large and has the second row of setulae on the hind tibia well developed.

¹Proc. U. S. Nat. Mus., vol. 43, p. 451.

SOME LIFE HISTORY NOTES ON THE BLACK WIDOW
SPIDER *LATRODECTUS MACTANS*.¹

BY PHIL RAU.

St. Louis, Mo.

This spider in livery of shining black decorated with bright red blotches, and called by Comstock the black widow spider, is often found in the vicinity of St. Louis under rocks and debris in sunny pastures. One specimen, with its round, white egg-case, was taken from her web high up in a corner of a barn on June 23, 1922.

In captivity she made four more of these egg-cases, on June 24, July 12, August 4 and August 15 respectively. After the making of each, her abdomen was shrunken to about half its former size, but it soon returned to normal proportions. Despite the fact that this individual had not access to the male, after its capture, the eggs in all five cocoons were fertile; this circumstance shows that it is not necessary for mating to precede each case of oviposition.

All the young in each cocoon emerged from one hole the size of a pin-head, probably made by the first restless spiderling. The emerging young of two cocoons were counted; one gave forth 101, and the other 92 spiderlings. The young at emerging do not resemble the mother, whose color is black and red, but they are all of a medium shade of brown. While the young do not spin nests of any certain form, they do spin webs of criss-cross threads to which they cling. Fig. 1 shows a young spider (enlarged four times) clinging to these strands. In the glass cage in which they were kept, they almost always rested with the ventral surface of the body upwards, and with four or more legs holding on to the strands of criss-cross silk, as figured above.

While one seldom sees a nest of definite contour when one finds these adult spiders under stones, here confined in a large glass box (an unused aquarium), this spider made a large hollow

¹Identified by Mr. J. H. Emerton.



RAU—LIFE HISTORY OF LATRODECTUS.

nest in which she spent all of her time except when prowling. Here too she made the cocoons, and here they reposed until such a time as the mother chose to kick them out. Fig. 2. shows the nest, natural size, with two cocoons, and the mother clinging to the lower one; just above is the larva of a mud-wasp which I dropped there for food. The spider was fed wasp larvæ of various species, white grub worms and grasshopper nymphs in this way, by dropping them on the web. The spider would always carry these morsels to the bottom of her cup-like den and spin a web around the food. The manoeuvres were always carried on at night, however. The young were less timid, and would feed upon the wasp larva at various times during the day. This was done by merely standing upon it and sucking out its juices. There was no evidence of the very young spiders covering the prey with web. The mother spider occasionally fetches the prey from some little distance and carries it into the nest. I once placed the quiescent prepupa of the mud-dauber on the floor of the cage three inches away; during the night she removed this to her nest. This shows not only that she can move loads as large as herself over and through her webby entanglements, but also that her prey need not be active to attract her attention.

The spider kept the nest very tidy, and carried out all the dried remains of her food that had accumulated. She did not do this every day, but occasionally when the accumulation of rubbish became conspicuous she turned in for the general house-cleaning. I once arrived in time to see the latter part of one of these affairs at 6 a. m. This activity is also usually a night affair, but this time she did not finish until after day-break. Just as I arrived, she took up her last fragment, a dried grasshopper nymph, from the bottom of her lair, carried it by a circuitous route up to the rim of the hollow and cast it overboard where it dropped to the floor. She carried it in a queer fashion; with one hind leg she held it close to the tip of her abdomen while she slowly picked her way among the criss-cross threads of her web, until she reached a point from where it could be dropped below. All of the debris had been carried out during the night, and most

of it had been carried some distance away. Most of the rubbish lay scattered at a distance of from eight to fifteen inches from the nest.

Her actions in regard to cleanliness appealed to me as commendable until I discovered that in her zeal she had also carried out and thrown away her own cocoon which she had just made; I wondered if she was not "throwing out the baby with the bath." Such a mental lapse or miscarriage of instinct caught my attention at once, and I watched for developments. But during the next few days, her behavior exhibited nothing short of maternal solicitude. As related above, in her early morning house-cleaning, she carried out the cocoon to a distance of eight inches, where it lay apparently discarded. The second morning thereafter I found the nest clean and the debris still scattered where she had dropped it. At 8 a. m. I dropped into the criss-cross webs above her den two wasp larvæ and a horse-fly, to tempt her appetite. At 9 p. m. the same day, I found the food items just where I had placed them, but to my astonishment, the cocoon that had lain on the floor eight inches away was now in the web, about two inches above her hollow nest, and the mother was clinging tenaciously to it. I promptly withdrew to avoid alarming her. My interpretation was that she was carrying the cocoon back to her den; an hour later when I again switched on the light, I found the cocoon nicely at rest on the bottom of the nest, and the mother clinging (I wish I dared say affectionately) to it. Her memory of her lost cocoon never failed her during the period of two and one-half days.

Quite likely the instinct-monger will interpret this behavior as a matter of accident; he will say that instinctively the spider carries food to the nest, and merely grabbed the cocoon in error. But I repeat that on top of the web were still entangled, three choice pieces of food that had remained untouched since morning, but she did not drag these nearby articles of food into her nest, but went afar and brought in the cocoon which she, in the heat of house-cleaning excitement, had discarded. Furthermore, let anyone who doubts the existence of maternal instinct here look at the picture and see the

mother with all her legs entwined about this little ball, and ask him if he can imagine a spider clasping a food morsel in loving embrace for long hours at a time in this fashion; then he will know whether or not this mother herself knew the difference. He will agree with me that in the field of instincts, going in quest of food and taking care of the young arouse two distinct and remote responses. I therefore maintain that, with certain maternal instincts as a foundation, this mother spider, by the aid of associated memory, modified or enlarged certain inherent capacities to gain certain ends, although I doubt if she would have been able to recognize her own cocoon among others.

During the entire next day, whenever I visited the cage, this mother was clinging to her egg-case, and up to the last visit the food had not been removed from the webs where I had placed it. At dawn of the next day (July 30), I observed that the wasp larva was moved nearer to the den and was much reduced in size, and so shrivelled that I felt sure that the spider had drained its body juices during the night. Strange to relate, the cocoon was carried out again during the night, taken from the center of the hollow cup and hung in the webs an inch above the nest. The Spider seemed, however, to be almost playing with the egg-case, for at 10 o'clock the same night when I paid her a visit, it was again back in the hollow of her nest. On August 1, when it was next observed, the cocoon was again out on the open web, two inches above the nest; the next day it was still in the same position. On August 4, the fourth egg-case had been made; the mother tightly clung to this in the hollow of her nest, while the one referred to previously had not been moved.

The third cocoon, the one left outside the den, gave forth 92 young on August 13, after a period of incubation of 32 days. During the night this egg-case had once more been carried away and dropped several inches away from the web, but I have no way of knowing whether this was done before or after the hatching occurred. An actual moult occurs in the young spiders before they emerge, for on opening a cocoon, one finds in addition to the empty egg shells the tiny shedding skins of the spiderlings.

The fifth and last egg-case was made on August 15. Just before the event, the opening of the hollow nest had been extended upward for about an inch. This mother died on August 25, ten days after completing her egg-case.

A second spider was taken on August 9, and died on September 20. Only fragmentary notes were made on this one. During this period she deposited four egg-cases, and all were found in a row in the corner of her cage among a tangled mass of threads that she made. While she had ample space, she made no elaborate or shapely nest as did the first.

This species is regarded as highly venomous, as are other species of this genus, and instances of fatalities are recorded by Warburton (Cambridge Natural History), Comstock (Spider Book), and Riley and Johannsen (Handbook of Medical Entomology). While the fact of its fatality to man is still in controversy, however, certain experiments carried on with mammals,¹ such as cats, dogs and guinea-pigs, show conclusively that this spider as well as others of the genus *Latrodectus* possesses a poison which paralyzes the heart and central nervous system.

¹Handbook of Medical Entomology, p. 16. 1915.

CONCERNING THE AVAILABILITY OF CERTAIN TAX-
ONOMIC CHARACTERS AND THEIR SIGNIFICANCE.
(DIPTERA).¹

BY C. HOWARD CURRAN.

Ottawa, Ontario, Canada.

During the past year or more I have been engaged at various intervals in searching for new characters available in the classification of Diptera, and these efforts have resulted, in some cases, in the selection of characters which will evidently prove of value in due time. Mr. J. R. Malloch has pointed out that the Tachinidæ are readily separated from the remaining groups of the Muscoidea by the presence of a strong convexity beneath the scutellum. From an examination of various families I find that this development is limited to three of them. I would suggest that this portion of the anatomy be termed, for convenience, the "metascutellum."

In a paper now in the hands of the printer, I have pointed out that I consider the Syrphidæ more closely allied to the Stratiomyidæ than is generally supposed and also their evident relationship to the Calyptrata. As the families Stratiomyidæ, Syrphidæ and Tachinidæ (inclusive of the Dexiidæ) are the three families known to me which possess a metascutellum, considerable confirmation of my previous conclusions has been secured. The possession of many characters in common by these three families would appear to indicate a much closer relationship than has heretofore been accorded them by taxonomists.

It appears that the Tachinidæ and Syrphidæ are both evolved from an ancestor more or less of the Stratiomyid type, the three families possibly having a common ancestor. At any rate it seems probable that the two first mentioned families originated within a reasonably short time of each other from common stock or very closely related forms.

¹Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

If we accept the foregoing suggestions as being more or less correct, several families—the Dolichopodidæ, Therevidæ, Asilidæ, Empididæ, and a few others, are left without indications of their origin, and it must be admitted that it is difficult to associate these families with any of those usually placed lower in the scale. However, there can be little doubt that these and allied families form a natural group and it is not difficult to trace true or fancied relationships from one family to the other. It may be necessary to eliminate the Tabanidæ from the line of direct descent and to consider for the present that they form a natural branch, therefore concluding that the Asilid group, through the Empididæ, are related to such forms as the Bibionidæ or even the Blepharoceridæ.

Malloch has recently pointed out that the Pyrgotinæ are evidently related to the Conopidæ, a view in which I concur. This indicates rather forcibly the relationship of the Pipunculidæ and Acalyptratæ.

If we consider the matter from the viewpoint of squamæ development, we find that the squamæ are large in the Tabanidæ, Stratiomyidæ, Syrphidæ, Muscoids and Tachinidæ, at least in so far as many members of these families are concerned. The exact value of this structure from the taxonomic point of view has not yet been determined. I am inclined to believe that it is a development more or less confined to robust species which are, or have been in the past, hoverers. Such a development seems to have been induced in flies which bred in liquid media, as the large squamæ have disappeared to a very large extent in those Syrphidæ which do not pass their early stages in such surroundings. If the squamæ have developed due to this habit, they must be looked upon merely as indicating habit and cannot be considered too seriously by the taxonomist.

Further, in connection with the squamæ, it should be pointed out that a character which is almost universal with the Stratiomyidæ occurs in the families enumerated in the preceding paragraph, but is not general. This is the presence of fine hairs or sparse pile on the upper surface of the lower squama, a character which is very evidently derived from the pubescence usually

found, but which has disappeared in many Tachinidæ. These hairs are found in some Stratiomyidæ, *Syrphus* s. s., *Bombyliomyia* of the Tachinidæ, and several Calliphorid genera. Here again we have a character of doubtful value taxonomically, but one which might be considered to indicate relationship, and at the same time one which may be used to great advantage in the treatment of several genera.

It should be remembered that there are many characters not of true generic or family significance which are nevertheless of the greatest importance as aids in determination, and it seems advisable in very many cases to treat these as of generic importance merely for our convenience. If, by the use of such characters, we split up several genera, placing many of their representatives in a single genus, and eliminate other supposed genera, we are simplifying the determination of many species; it is surely advisable to use such a character. If our classification is such that genera are of but little assistance in the determination of species, or are not truly separable from each other, it is evident that we need a change in methods:—either that, or the elimination of genera entirely and the use of family names in a generic sense. A superabundance of genera is almost an equivalent of the foregoing condition. Perhaps the best example of this latter condition is to be found in the Tachinidæ where more than one thousand genera have been proposed, and at least half that number are recognized. It is not likely that more than one hundred genera should be recognized in this family if we are to have a classification of the maximum assistance in determination of the species. Characters being investigated at present indicate that several genera in the Tachinidæ and Dexiidæ can be lumped together to great advantage, or at any rate isolated into very distinct and easily recognized groups.

The above information is submitted in the hope that work along the lines indicated may be stimulated. There is much to be done but one must proceed carefully in dealing with a subject of this nature, taking pains not to overemphasize the value of such characters as have been enumerated, and to investigate as fully as possible before recording results.

DORATURA STYLATA BOHM IN MASSACHUSETTS

BY GEO. W. BARBER.

Cereal and Forage Insect Investigations, Bureau of Entomology,
U. S. Department of Agriculture.

The discovery of *Doratura stylata* Bohm. in Massachusetts adds an interesting leafhopper to our constantly growing list of insect immigrants. During 1923 three specimens of this species have been taken as follows:

A brachypterous female, Marshfield, Mass., August 3.

A brachypterous male, Plymouth, Mass., August 1.

A macropterous female, Plymouth, Mass., September 11.

Specimens collected in Plymouth were taken by sweeping in a cranberry bog grown up to grass, the specimen from Marshfield by sweeping coarse grass in a fresh water marsh.

This species is adequately described and figured by Melichar 1896 (*Cicadinen von Mittel-Europa*, p. 210). It is apparently not uncommon both in continental Europe and in England. Buckton 1891 (*Monograph of the British Cicadæ or Tettigidæ* Vol. 2, p. 20) notes that the macropterous forms are extremely rare.

PROCEEDINGS OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The meetings of the Club were resumed on September 11, 1923. Prof. Z. P. Metcalf of the North Carolina Agricultural Station who had spent the summer in Boston read a paper on "The Station Entomologist" from the various standpoints of the public, the profession and the entomologist himself.

A letter was read from Mr. Austin Clark, a former member who had been in the neighborhood of Boston part of the summer and had collected butterflies especially *Peniseca tarquinius* which was unusually abundant.

Mr. C. W. Johnson had investigated the 17-year Cicada on Cape Cod and found it abundant along the shore between Falmouth and Hyannis and northward to Bourne and Sandwich. It was also reported near Plymouth and down the Cape between Wellfleet and Truro. Its first appearance was about June 1 and mating and egg-laying continued from June 25 to the last of July. Mr. Metcalf showed young Cicadas which hatched from oak twigs brought from Cape Cod.

Mr. Johnson showed the mud nests of the wasp, *Ancistrocerus birenimaculatus* and a letter from Mr. Zeissig who had raised the wasps and numerous parasites which were exhibited.

Mr. Plath told about his summer's work on bumblebees of which he had 62 colonies under observation including two species not before found. Some of the nests were destroyed by a skunk which was caught and kept for some time in confinement and its habits in relation to the bees studied.

At the meeting of October 9 several members gave accounts of their summer work. Dr. Bequaert of the Department of Tropical Medicine of the Harvard Medical School spent part of the summer at Columbus, Ohio to study the collection of Tabanidae of Prof. Hine. Field excursions were made in the neighborhood and a new Tabanus was found, allied to *T. longus*. A rare fossorial wasp, *Rhinopsis melanognatha* and a cyrtid fly *Acrocera subfasciata* were found on the bark of trees.

Mr. C. W. Johnson exhibited the tropical *Thysania zenobia* taken by J. D. Smith at Holbrook, Mass., September 9, the second one found in New England.

Mr. Johnson showed a fly from Mt. Desert which is probably the European *Spania nigra* which has a very variable venation.

Mr. J. H. Emerton gave an account of the summer collecting of spiders on the farm of Nathan Banks on Winthrop Pond in Holliston, Mass. Over 160 species were taken between April and October.

Mr. Plath showed some old nests of bumblebees which contained large numbers of larvæ of parasites. A nest had lately been found in the Arnold Arboretum four feet under ground

with an entrance tunnel ten feet long. Thirty female bees were found hibernating in the earth near the mouth of the tunnel.

At the November meeting Prof. C. T. Brues read a paper on the triungulin larva of a meloid beetle from the Galapagos Islands. The peculiar mandibles were described which are modified for holding to the hairs of bees on which the larvæ are carried to the nest where they become parasites of the bee larvæ. The paper concluded with a review of the triungulins of Meloidæ and Stylops.

Prof. W. M. Wheeler followed with a paper on the planidium larvæ of various Hymenoptera and Diptera. Some brilliantly colored Chalcids were found in ant's nests where they grew up as parasites in the ant larvæ, having been brought into the nest in the planidium stage attached to adult ants. The complicated life histories of several species were described.

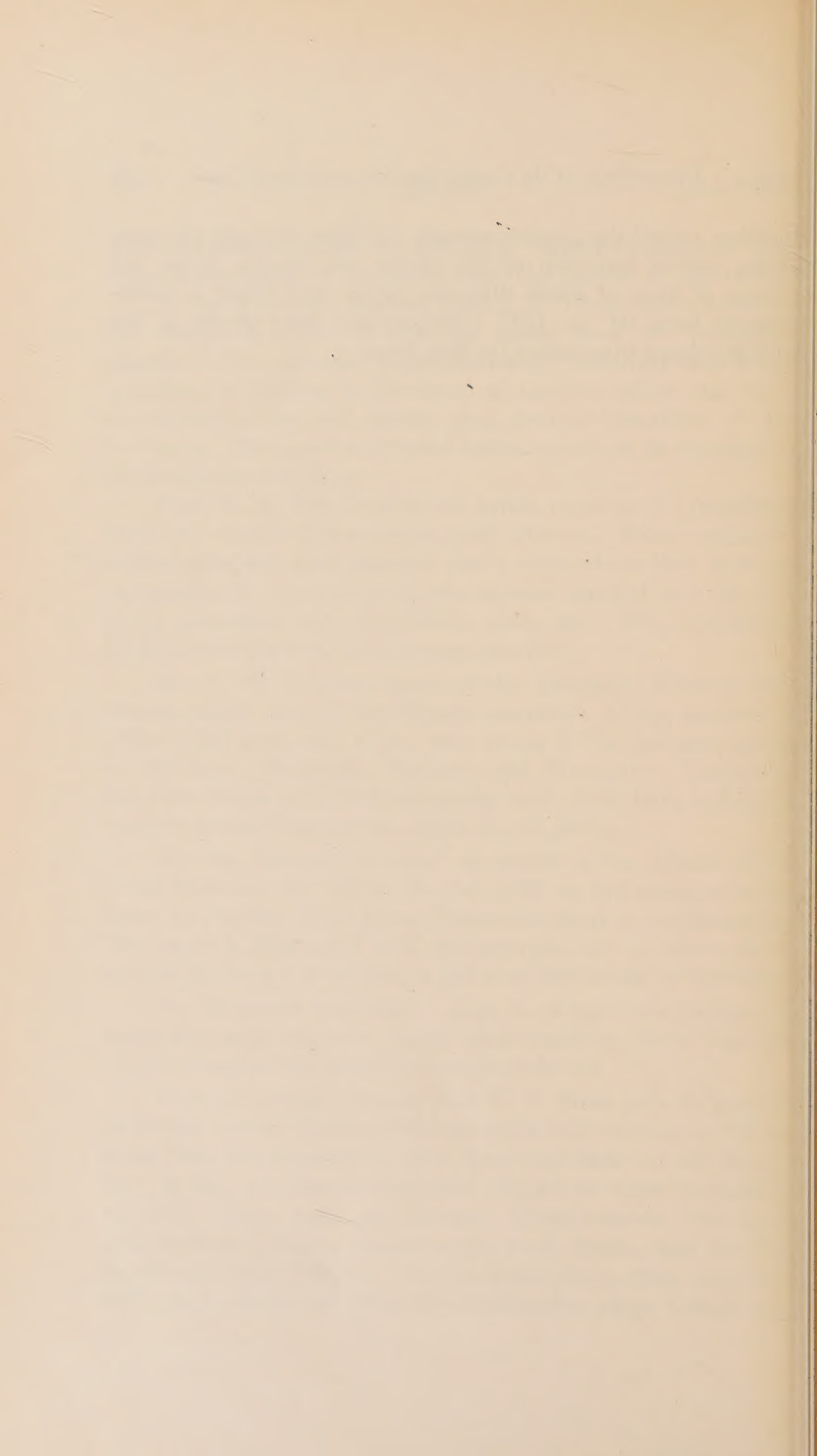
Mr. C. W. Johnson spoke of the European *Muscina pascuorum* which was so surprisingly abundant in the autumn of 1922. This year only a few were found in the fall and spring in Attleboro, Brookline, Walpole and Worcester. Specimens had been found in the fall and spring under loose bark indicating that the insects hibernate as adults in such places.

Dr. Jos. Bequaert reported an article in the Annals of the Natal Museum, So. Africa, October 1923 on the eating of small fishes by a spider of the genus *Thalassius* allied to our *Salonedes*. The paper is illustrated with photographs, one of which shows a spider in the act of catching a fish near the surface of the water.

Dr. Bequaert described a nest of wasps from Panama in which the paper cells were closed, not as usual by convex caps but by flat covers a little inside the mouth of the cell.

At the December meeting Prof. C. T. Brues gave an account of his last summer's automobile excursion from Boston to Yellowstone Park accompanied by Mrs. Brues and their son and daughter. A tent was carried and they camped at night throughout the trip. Their route was through Massachusetts, New York and Ohio to Chicago, thence to St. Paul, Minn., and the Bad Lands of North Dakota. At the Yellowstone Park they met Prof. A. L. Melander from the Washington State College and

together visited the geysers, springs and lakes through the park giving special attention to the plants and insects of the hot springs in some of which dipterous larvæ were found at temperatures from 90° to 130° . Photographs were shown of the springs colored from nature by Mrs. Brues.



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